Tam Hang Rockshelter: Preliminary Study of a Prehistoric Site in Northern Laos

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INTRODUCTION

PREHISTORIC RESEARCH IN MAINLAND SOUTHEAST ASIA was initiated by the French with the establishment of the Geological Service of Indochina (GSI) in 1897. The GSI began to study the geology of Tonkin, Yunnan, Laos, and southern Indochina before 1919, later extending their knowledge to northern Indochina and Cambodia. In the meantime, several major *Homo erectus* findings occurred in the region, which contributed to the palaeoanthropological debate that prevailed in the 1930s. These discoveries did not involve French but rather Dutch and German scientists. In 1889, E. Dubois discovered *Pithecanthropus erectus* on the island of Java in Indonesia (Dubois 1894); then in 1929, W. Z. Pei found *Sinanthropus pekinensis* at Zhoukoudian in China (Weidenreich 1935), while G.H.R. von Koenigswald discovered additional *erectus* remains in Java (von Koenigswald 1936). In response, the GSI refocused on the palaeontology and palaeoanthropology of the region, until the cessation of fieldwork activities in 1945 due to the beginning of the war with Japan.

Jacques Fromaget joined the GSI in 1923 and conducted tremendous excavations in northern Laos and Vietnam as if motivated by the desire to discover some Indochinese hominid remains. Similar to many of his geologist colleagues around the world, Fromaget was not only interested in soil formations but he was also concerned about prehistory. Along with GSI members, M. Colani, E.

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Patte, and H. Mansuy, he conducted numerous archaeological surveys in the region, resulting in many publications in the Bulletins and Memoirs of the GSI. Thanks to this, Colani discovered the Hoabinhian culture in Tonkin (northern Vietnam) with the help of Mansuy (Colani 1930; Mansuy 1924; Mansuy and Colani 1925), and the famous Plain of Jars in northern Laos; Patte discovered several Neolithic shell middens at Da But in northern Tonkin (Patte 1932, 1936); Fromaget explored Tonkin and northern Annam where he discovered numerous fossiliferous sites especially in northern Vietnam at Langson, Thung Lang, and Minh Lé, as well as in Laos at Houei Hoc, Tam Pa Loï, Tam Pong, and Tam Hang (Fig. 1) (Arambourg and Fromaget 1938; Fromaget 1936, 1937, 1940a, 1940b).

In 1934, Fromaget conducted extensive excavations at Tam Hang. He discovered middle Pleistocene fossil-rich deposits (Arambourg and Fromaget 1938; Fromaget 1940a), as well as late Pleistocene/early Holocene human biological and cultural remains (Fromaget 1936, 1937, 1940b; Fromaget and Saurin 1936). Unfortunately all of this archaeological material has since been lost, although the skeletons are currently accessible at the Musée de l'Homme in Paris (Demeter 2000; Fromaget 1936, 1937, 1940b). Among the 17 human skeletons he found buried in the shelter about 1.5 and 2 m from the surface, three have been sampled for radiocarbon dating. Only one skeleton contained enough collagen for the ^{14}C to be retrieved and has given a positive result of $15{,}740 \pm 80$ B.P. (Demeter 2000).

After the re-location of the site by Thongsa Sayavongkhamdy, an international team began excavations in 2003. This article discusses the historical and scientific value of the site for palaeoanthropological and archaeological research in mainland Southeast Asia. In this article we describe the recently discovered cultural remains, which consist of an exclusive lithic industry and a more common ceramic ware of a different period.

THE EXCAVATION

Tam Hang is located in the Annamitic Chain at an altitude of 1120 m in Hua Pan Province (Fig. 1). Its geographical coordinates are 20°24′N and 104°02′E. The site is a cave and rockshelter complex with a geologically active karstic network. The Pleistocene sediments, which preserved a mammal fauna, were exposed in the walls and within the karstic network of the rockshelter (Fig. 2: THS1), while the archaeological artifacts and human remains lie under the shelter (Fig. 2: THS2). Fromaget excavated three localities along 100 m (Fig. 2): North Tam Hang (THN), Central Tam Hang (THC), and South Tam Hang (THS). At some points, his terracing works reached 8 m deep by 5 m wide. Over the year, the geologist moved more than 3500 m^3 of earth and sediment. Unfortunately, no report from this excavation has been recovered and all the archaeological material discovered has been lost.

We identified the geological deposits at THS as THS1 and THS2. THS1 was attributed to Middle Pleistocene according to study of the faunal remains in the breccias (Bacon et al. 2008), while THS2 was labeled as late Pleistocene/Holocene based on the artifacts. At THS2, we decided to open the excavations laterally and toward the plain Fromaget's trench, so that we could reach undis-

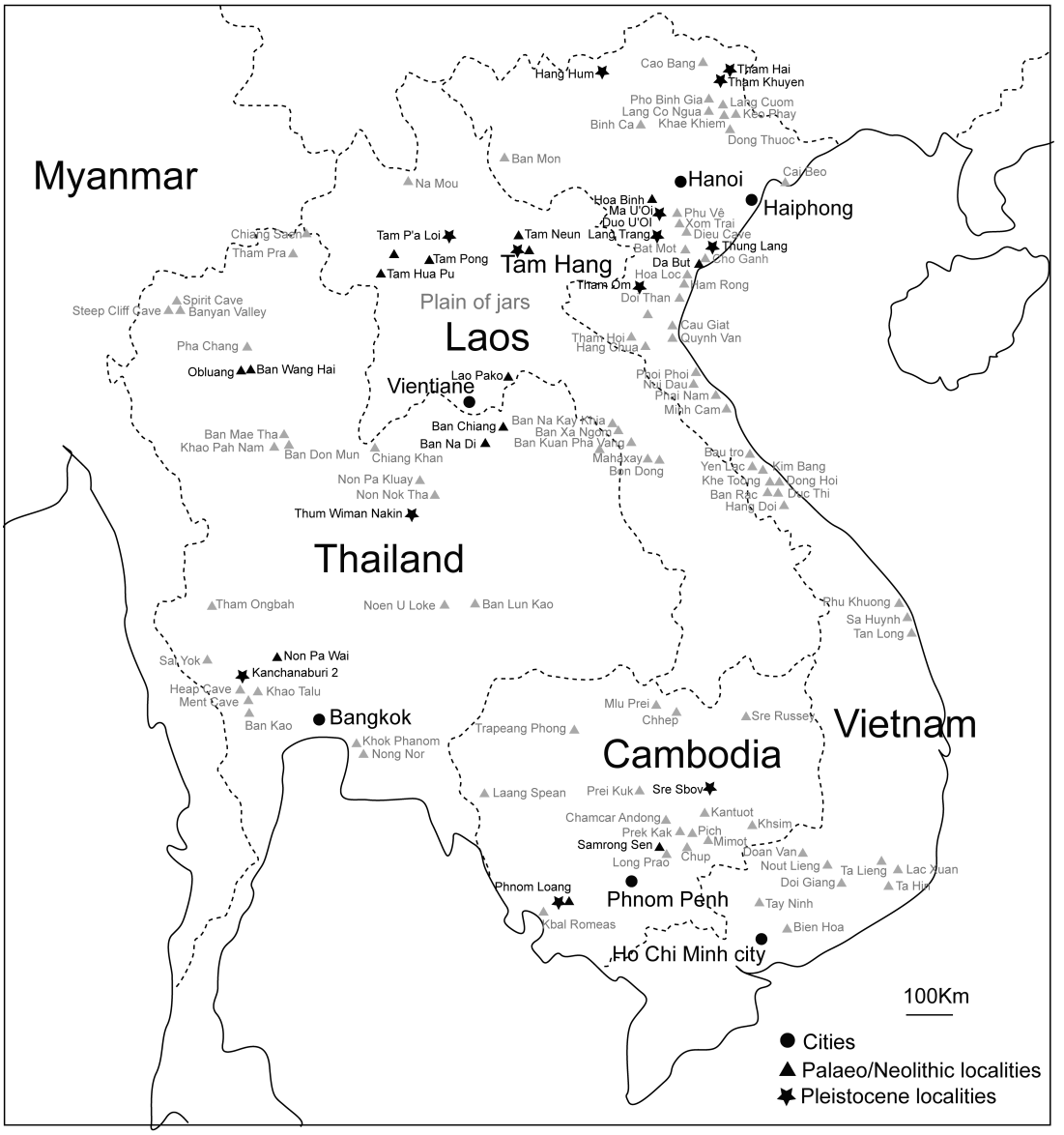

Fig. 1. Continental Southeast Asia map showing Pleistocene and Palaeolithic/Neolithic sites (localities cited in the text are in bold).

turbed layers (Fig. 2). Due to the specific configuration of the site, a suspended grid of 1×1 m was deployed above the archaeological floor. The excavation extended over 10 $m^2 \times 2$ m deep. For each artifact, the three-dimensional coordinates were recorded (Fig. 3). This particular positioning method has allowed the virtual reconstitution of the layers, which facilitates understanding of the artifacts' depositional process.

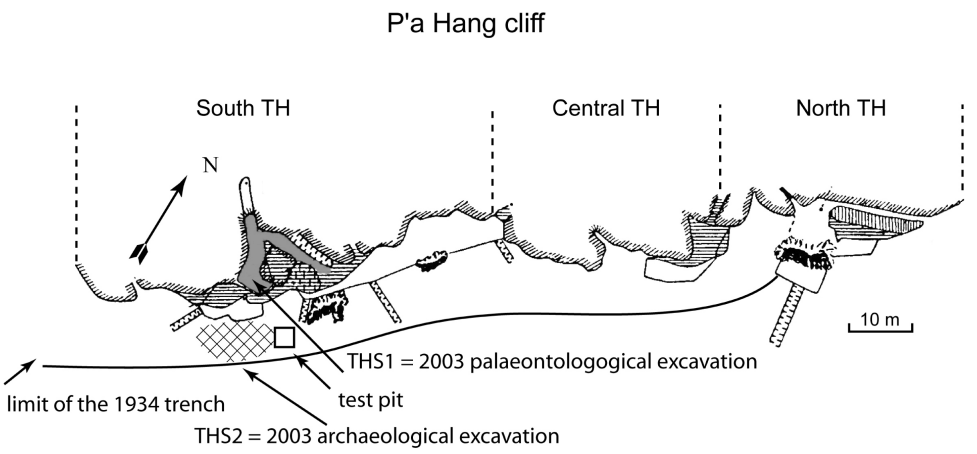

Fig. 2. Map of the Tam Hang site (modified after Fromaget 1940*a*).

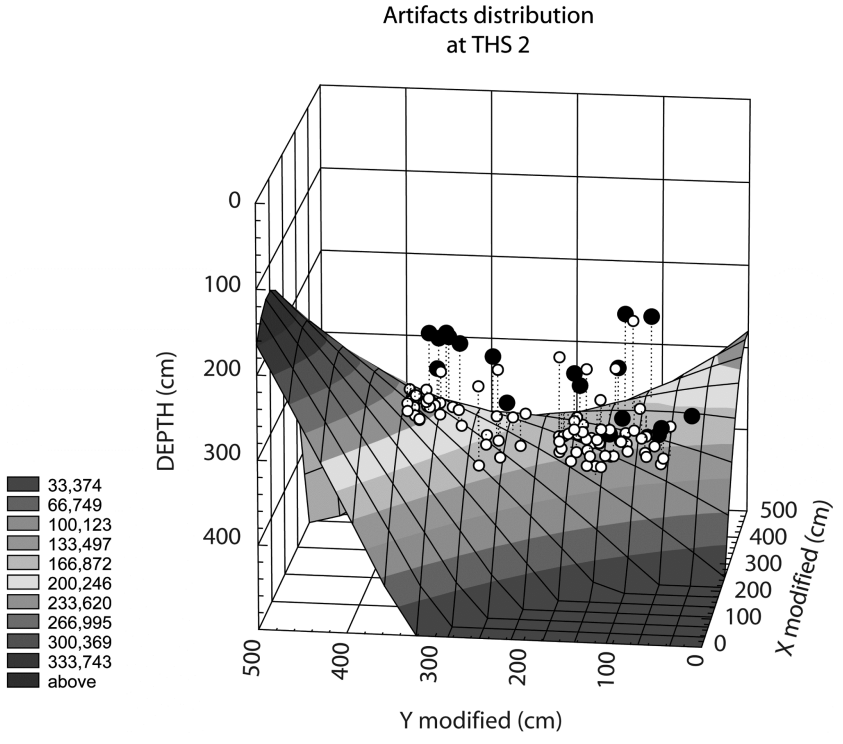

Fig. 3. Three-dimensional distribution of the artifacts at THS2. The black circles represent pottery fragments, the white circles stone-tools.

STRATIGRAPHY

In order to fully comprehend the stratigraphy of THS2, we dug a 3-m-deep test pit, in addition to the profile our excavation laid out in the direction of the rock-shelter (Fig. 2). On the graphic presentation, the stratigraphic column is composed of two superimposed parts: the archaeological excavation (upper part) and

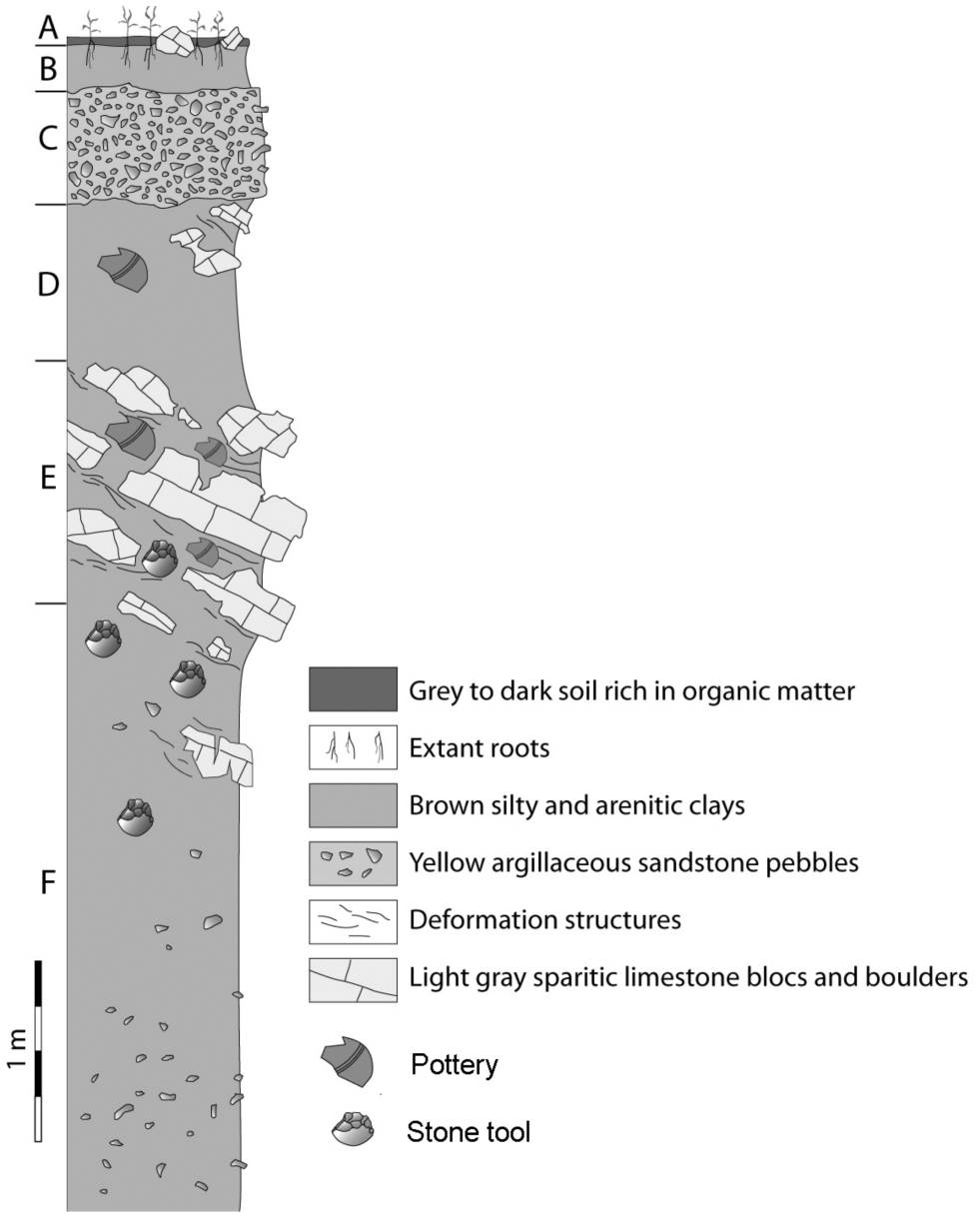

Fig. 4. Stratigraphy of THS2 showing the cultural layers B, D, E, and F (P. Duringer).

the stratigraphical test pit (lower part). Analysis of the profile shows that clays of different color and consistency, as well as two well-developed conglomeratic beds, dominate the deposits. In total, six successive beds different in consistency and color were described from the top to the bottom of the profile (Fig. 4):

• The 10–15-cm-thick upper layer (layer A), contains organic matter—a rich sandy-argillaceous soil deposit characterized by numerous in situ roots of extant plants. Much surface debris is included in this layer.

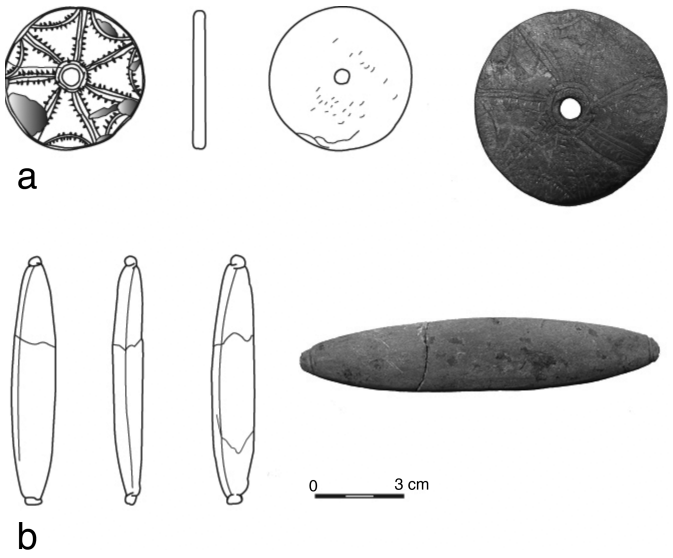

Fig. 5. a: circular whorl (engraved); b: elongated whorl.

Layers B, D, and F are similar in color and consist of brown to red-brown silty pelites, often with a variable proportion of quartzite and arenite. Granule to gravel-sized Fe/Mn-rich pisolith concretions are scattered throughout the profile from top to base but never exceed 1 percent. Layer B produced artifacts such as the circular decorated spindle whorl and two elongated whorls (Fig. 5). Layer D yielded ceramic fragments. In the lower part of layer F pebbles appear inside the pelites. The pebbles consist of centimeter-sized argillaceous sandstone (as in layer C). The density of the pebbles increases toward the base of the profile. The lithic industry was found in this last layer.

Layer C is an argillaceous-cemented conglomerate. The pebbles consist of poorly cemented argillaceous sandstone. The conglomerate is more or less channel-shaped laterally.

Layer E is characterized by huge limestone boulders derived (collapsed) from the cliff. The deposition in several layers clearly shows that the conglomeratic layer consists of several deposits (collapsed from the cliff), which occurred over time. All blocs present the same slope descending along the shelter. The archaeological surface follows this same slope in this particular layer.

Some rare boulders or cobbles can be observed in layer B and in the upper part of layer F.

CULTURAL LAYERS

During the excavation, we discovered two main cultural layers, one on top of the other, apparently of different periods, containing pottery fragments (layer D), a lithic industry (layer F), and in between an admixing or transition layer (layer E) (Fig. 4). Animal bone fragments with traces of burning have been found across both cultural layers and have been sampled for absolute dating. Unfortunately,

the poor collagen content of the bone precludes any dating so far. Nevertheless, the successful dating of the human skeletons discovered by Fromaget 1.5 to 2 m deep give a maximal age around 15,700 years for the archaeological layer. This dating combined with the attribution of the fauna to modern species that have been assigned to *Macaca* cf. *fascicularis, Arctonyx collaris* cf. *rostratus, Sus scrofa, Sus* cf. *scrofa, Bos frontalis, Bos* cf. *frontalis, Bos sauveli, Bos* cf. *sauveli, Bos javanicus, Bos* cf. *javanicus,* cf. *Bubalus bubalis,* Cervinae indet., *Axis porcinus, Cervus* cf. *unicolor,* Rhinocerotidae indet., and *Rhinoceros* cf. *unicornis,* confirms a chronological frame extending from Late Pleistocene to Holocene periods.

The Pottery

The pottery is very fragmentary. A total of 389 fragments have been classified into 32 sets. These have been divided into 95 groups, their identity based upon clay color, thickness, and surface treatment; there are some 70 vessels. Partial reconstruction could be carried out within each group. The fragments belong to vessels with globular bodies and quite wide necks (Figs. 6, 7) (J19-1, J3-1/4-3, J10-3), small bowls (J11-15, 1-4), cylindrical vessels with straight rims (J14-1, 8-1), and a big globular jar with a short neck, which is quite wide and has an everted rim (J11-1). No base fragments have been found. Several rim fragments belong to sub-vertical elements with flat lips (Figs. 6, 7).

The great majority of fragments (71%) present an impressed or incised decoration with various motifs (Figs. 6, 7). The most frequently employed motif consists of oblique discontinuous lines. These may be more or less parallel and may cut through each other. These designs are crude and irregular and were made on a badly fired thick gray ware with visible mineral temper. Some vessels have motifs composed of vertical and parallel cord impressions, which are more or less regular. This design could be the result of using a rope wound around a paddle. Some cord impressions may have been smoothed over the entire surface with the use of a piece of textile. Some vessels present a design composed of parallel, horizontal, vertical, and oblique lines, which are thin and regular. These lines can cross each other at some points, forming a grid pattern. Other vessels display an ornamental band starting 3 cm below the neck, composed of three horizontal parallel lines spaced by 1 cm. This space is filled with small, vertical lines that are more or less parallel.

The clays used are diverse. Gray clays are predominant, but the internal and external surfaces are often beige, sometimes gray, rarely orange, and sometimes dark gray in color. This variety of colors could result from differences in the firing process (oxidizing or reducing). In general, the clays contain a temper of mineral inclusions. Some fragments are thin and smoothed on the inside surface and display a very regular decoration on the exterior. Some fragments are badly fired and the ware is quite crude. Some pieces appear to have fingerprints on the inside surface.

The Lithic Industry

At the top of the ceramic layer have been found a circular decorated spindle whorl and two other elongated whorls, all made from stone (Fig. 5a, b). Among

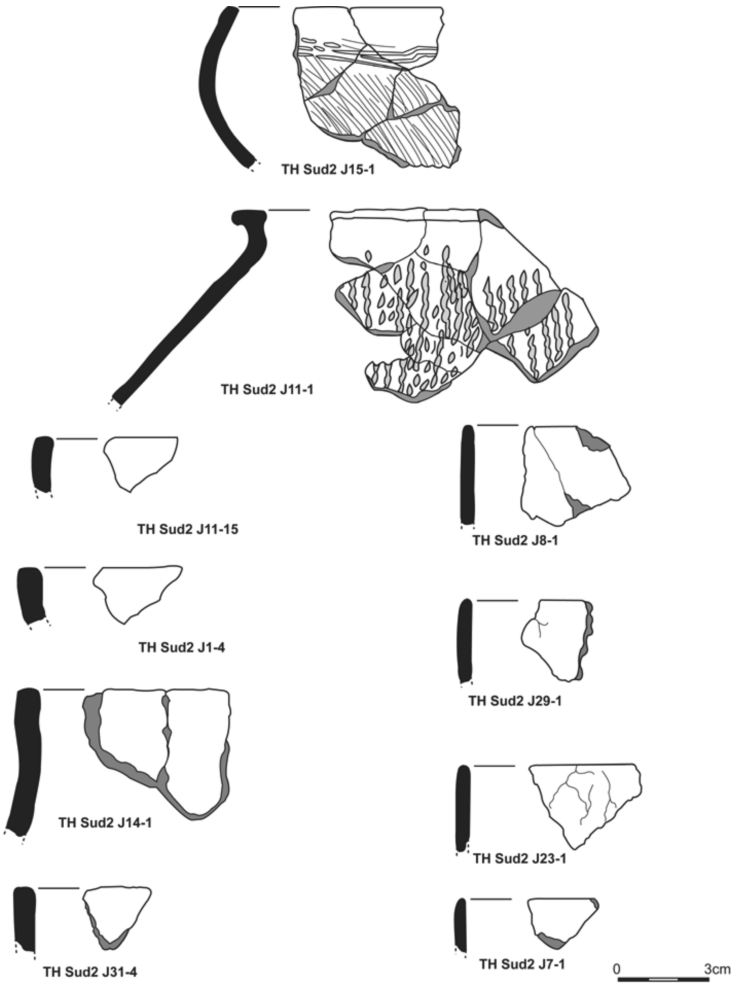

Fig. 6. Pottery rims and drawings (A. S. Coupey).

the 217 stone tool artifacts, only seven pieces were found mixed with ceramic elements from the upper layer. Ninety-eight percent of the artifacts were made from a locally available quartzite, a non-cryptocrystalline raw material from the river. Two percent were made from andesite and sedimentary rocks. This tenacious coarse-grained material is not very good for knapping activity, since breakage restricts the potential to control size and shape of the removals.

Thirty-seven stones found on the site are allochtonous in origin and do not show either any intentional shaping nor any traces of use-wear. Three morphological types were noticed: plano-convex cobbles or semi-cobbles, triangular fragment pebbles, and quadrangular blocks, larger than the artifacts themselves. Consequently, we infer that this raw material could have been deliberately collected from the riverbed for later use.

This lithic assemblage includes large stone tools, flakes, and cores. All the tools were made by direct percussion with a hard hammer, as illustrated by the two ob-

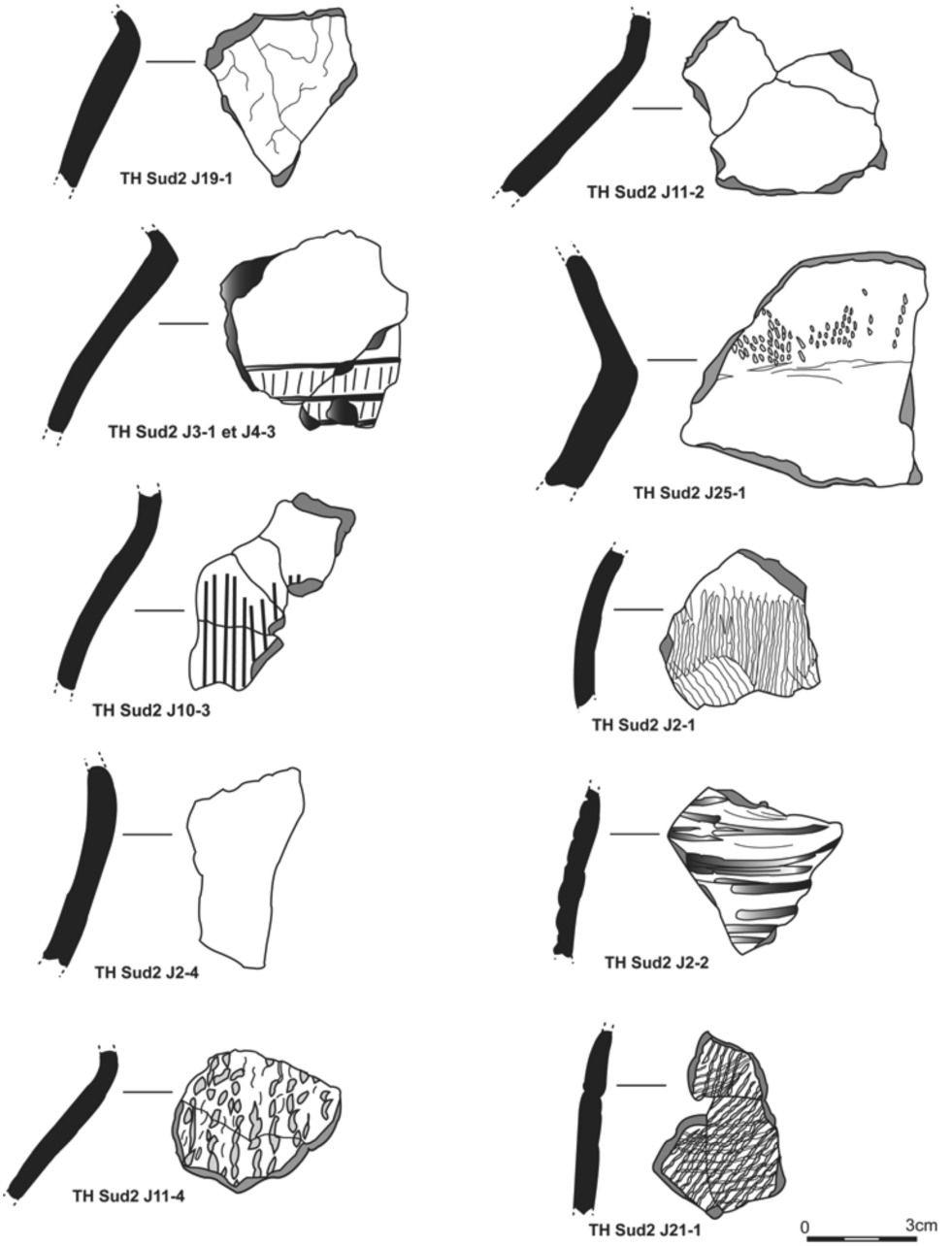

Fig. 7. Pottery necks, bodies and drawings (A. S. Coupey).

long pebbles of 8 cm and 12 cm length found in the same layer (Fig. 8f). Ninety-three flakes have been identified. A high proportion (34%) of these are composed of fragments and over-passed flakes. These accidents occur during the reduction sequence (Siret fracture, distal fracture) and are related to the quality of the raw

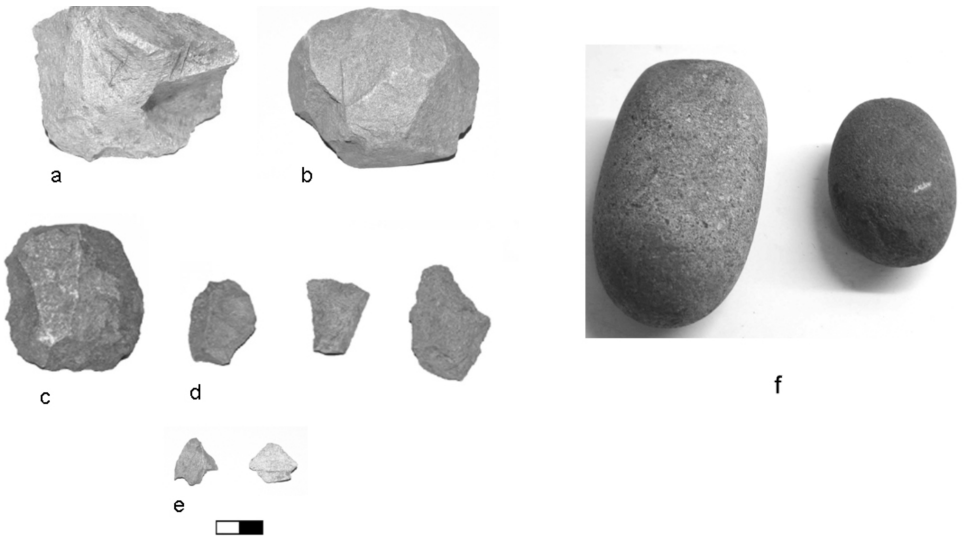

Fig. 8. Stone tool samples. a: core; b and c: scrapers; d: used flakes; e: pseudo-points; f: pebbles.

material. Three flakes (F21, F34, F85) show a point shape (Fig. 8e). Nevertheless, these elements are not stone tools but waste flakes, resulting from the convergent reduction strategy.

Less than 15 flakes have been modified for use. The overall assemblage indicates a production without any post-alteration intention except for direct use. However, a few tools have been retouched, such as burins. It appears that the tool makers chose stones with specific technical characteristics (angle, delineation) rather than with a particular morphology, as is often the case in standardized industries. Retouched blanks have been found, in J23, K21, and K23 squares. This corpus is composed of eight burins (seven angles, one dihedral), one borer, and two pieces showing marginal retouch on the edge (Table 1). Among the elongated specimens, there are four laminar flakes, six elongated flakes, and one blade, with width and thickness remaining smaller than those pieces from the debitage waste (Table 2). The production of this kind of specimen can occur at any time during the removal process.

Unretouched blanks have been found in J23 (9 pcs) and in K21 and K23 (3). They are bigger and larger than the debitage waste pieces. This corpus is composed of large flakes (8), long flakes (4), laminar flakes (4), and blades (2). Three types of butt have been recognized: natural (7), cortical (3), and dihedral (2). These last two specimens are rather thick. A common knapping process has been employed. The study of the techno-functional features identified on 15 blanks shows that in most cases (13/15), only one edge is used. On large flakes, the distal cutting edge is rectilinear or convex and is used on 75 percent to 100 percent of its length. Four flakes and one blade show that 88 percent to 100 percent of their cutting edges were used. Five elongated blade blanks and one large flake have rectilinear lateral cutting edges, which may be convex or concave and were used along 29 percent to 62 percent of their length.

Table 1. Typology and measurements (mm) of retouched blanks.

inventory n°	material	L(mm)	W(mm)	TH(mm)	L/W	L/Th	butt type	butt thickness	butt angle	typology
F20	quartzite	23	16	5	1,4	3,2	natural	5	90°	Angle burin
F20	quartzite	25	17	5	1,4	3,4	natural	5	90°	Angle burin
F20	quartzite	25	16	5	1,5	3,1	natural	1	90°	Angle burin
F33	quartzite	22	21	2	1	10,5	natural	2	100°	Angle burin
F43	quartzite	50	28	6	1,8	4,7	natural	5		
F45	quartzite	45	30	18	1,5	2,5	natural	18	130°	2 micro-notches
F55	quartzite	30	37	3	0,8	12	natural	3		Borer
F55	quartzite	34	27	8	1,25	3	natural	7	100°	Angle burin
F67	quartzite	25	23	5	1,1	4,6	natural	4	90°	Dihedral burin
F67	quartzite	35	17	3	2	5,9	natural	6	130°	Angle burin
F83	quartzite	75	50	15	1,5	3,4	natural	15	110°	Micro-scraper

TABLE 2. MEAN DIMENSIONS (mm) OF THE FLAKES.

MEASUREMENTS (mm)	WASTE FLAKES	RETOUCHED BLANKS	USED BLANKS
Length (mean)	35,3	36,6	33,4
Width (mean)	32	26,6	34,8
Thickness (mean)	7,7	6,5	9,6

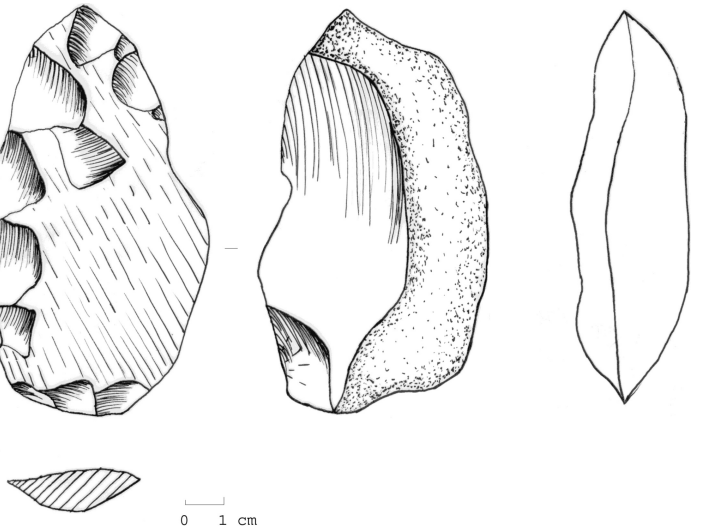

Fig. 9. Bifacial tool from THS2 (E. Patole-Edoumba).

These flakes have been struck from core-nodules (Fig. 8a) in a very short reduction strategy. Each core shows only one to six removal scars, and the manufacture process is based on a unipolar or bipolar debitage.

There are also tool-blocks, including two massive scrapers (Fig. 8b, c) and one bifacial tool partially worked on the two faces (Fig. 9). This last artifact would be a "transition tool between choppers and real handaxes" (Boeda 1997; Bordes 1961, 1984) and belongs to the Hoabinhian tradition. Nevertheless, this artifact is not a classic Hoabinhian tool (Forestier 2000). However its shape is asymmetric and one surface shows series of semi-peripheral and convergent removals, with the main surface less convex than the other. Consequently, this tool could be considered as unfinished, since its cutting edge is too irregular to be functional. The presence of these three tools in the same layer as the flakes and cores is evidence of the coexistence of two types of particular flaking technologies: the "debitage" and the "façonnage."

DISCUSSION AND CONCLUSION

Little is known about human origins and early prehistory in mainland Southeast Asia. Only a few archaeological sites with cultural artifacts, which cover the late

Middle to Late Pleistocene, have been identified (Colani 1930; Demeter 2000, 2006; Forestier 1998, 2000; Fromaget 1936, 1940b; Higham 2002; Mansuy 1924; Mansuy and Colani 1925; Patte 1932, 1936; Pautreau et al. 2001; Pookajorn 1991; Santoni et al. 1990; Saurin 1966; Tan 1997, 2001). As for human remains, only a few have been discovered, mostly isolated teeth from sites in Vietnam (Ciochon and Olsen 1986; Ciochon et al. 1996; Cuong 1985; Demeter et al. 2004, 2006; Kha 1976; Olsen and Ciochon 1990), Thailand (Tougard et al. 1998), and Laos (Fromaget 1936, 1940b). Given this situation, the origins of modern humans or the transition between *H. erectus* and *H. sapiens* is still a much-debated question, since the chronology shows that these two species would overlap for several thousand years as shown by the *erectus* and *sapiens* specimens found, respectively, at Ngandong (53,000–27,000, Java, Indonesia; Falguères 2001; Swisher et al. 1996) and at Liujiang (65,000, northern China; Wu and Poirier 1995).

Concerning later periods, recent archaeological researches have provided a better understanding of the prehistory of the region. It is commonly accepted that the Late Pleistocene periods involved two distinct adaptations by hunters and gatherers (Higham 2002). The hunters were interior uplands foraging groups focused on terrestrial resources and settled in cave entrances and rockshelters as in the Hoabinhian culture, whereas the gatherers were coastal foraging groups focused on marine resources and occupying the coastline. Tam Hang rockshelter was occupied by hunters who appear to have produced stone tools during the Late Pleistocene periods, whereas the Holocene period saw the spread of a new economic system based on agricultural production along with the manufacture of earthenware storage vessels, such as those found in the later cultural levels at Tam Hang.

While it is likely too premature to consider the Tam Hang lithic assemblage as an "industry" at this stage, it is nevertheless characterized by a specific tool typology and also the particular flaking technology used: the "debitage" and the "façonnage." The corpus studied shows a high proportion of flakes potentially usable as tools, struck from a core. The method used is relatively simple compared to more complex systems known as Levallois or blade debitage, the latter implying the shaping of a certain volume necessary for the production of blanks. The debitage mode identified at Tam Hang would certainly belong to the common technological system found all over Southeast Asia (Vietnam, Thailand, Malaysia, Philippines, and Indonesia) known as the core flakes industry from the Late Pleistocene (Bellwood 1997; Bellwood et al. 1998; Forestier 1998, 2000; Patole-Edoumba 2002, 2006).

Nevertheless, the originality of the Tam Hang assemblage lies in the presence of three tools shaped from raw material blocks. The presence of one specimen showing bifacial removals suggests a Hoabinhian tradition. This specimen shows only a few morpho-technical criteria such as an asymmetry and two successive removals with a sharpening phase. It belongs to one of the five categories of Hoabinhian recognized by several authors, "the bifacially flaked pebble tools" (Bellwood 1997; Von Heekeren et al. 1967; Matthews 1966; Moser 2001). The coexistence of flakes and cores in the same level as the Hoabinhian tradition is not incompatible: Bellwood noted that "a large category of other forms including hammer-stones and a few rare blades, together with cores and flakes which are

frequently omitted from reports" belong also to the Hoabinhian tradition (1997:66). In these circumstances, Tam Hang assemblages could explain how these two categories of tools and technical traditions evolved and interacted.

Considering the archaeology of the region as a whole, it would be consistent to find this cultural facies in Laos, characterizing the Late Pleistocene (29,000 B.P., Obluang site in Thailand; Santoni et al. 1990) and the Early Holocene periods. Hoabinhian tradition is strongly present in Vietnam and Thailand but also in Malaysia and Indonesia where it spread along coastal sites especially in northern Sumatra (Forestier 2005; Moser 2001; Tan 1997). The "debitage" and "façonnage" techniques are two different knapping systems and therefore could belong to two distinct periods of time, the shaped tools being found in stratigraphically lower layers. Concerning the evolution of techniques in Southeast Asia, the Tam Hang site provides an opportunity to study how hunter-gatherers made the transition from a uniface shaping cognitive process where each operation results in a cutting edge in a planoconvex volume, to a flaked-tool production method based upon independent management of the core surfaces. Nevertheless, the coexistence on the same site of these two techniques needs to be confirmed by further fieldwork in a detailed chronological context.

Comparative elements for pottery typology do not exist in Laos. However, the forms found at Tam Hang can be found at most of the Southeast Asian prehistoric sites. Cord-marking and fine incised technique are two types of decoration characteristic of Neolithic and Iron Age pottery in Southeast Asia, while the use of the paddle for decorative purposes is very common in the region from the Neolithic to the present day. Comparative elements can be found in Thailand at Spirit Cave where the same surface treatment (paddle cord-marking and incised technique around the neck) is found on fragments of pots with average dimensions (Lampert et al. 2003). Neolithic and protohistoric sites at Obluang (Chiang Mai Province) have produced the same decoration on pottery (Santoni et al. 1990). Paddle impressions present on the bases and bodies of vessels were found at Ban Wang Hai for the Iron Age (Pautreau et al. 2001). In central Thailand, Neolithic burials at Non Pa Wai have produced vessels with cord-marked decoration dating to 3800–3600 B.P. (Higham 2002).

Furthermore, numerous sites from the same period and region, as well as in the northeast, have produced pottery with similar decoration. These motifs are also found in Cambodia at Samrong Sen, a Neolithic to Early Bronze Age site dating to around 2300 B.P. (Carbonnel and Délibrias 1968; Matringhem 1995) where surface treatment is dominated by paddle cord-marking and incised technique forming stripes on the neck and rim areas. The use of a paddle can also be part of the fabrication process of the pottery, but at Tam Hang this tool was only used for surface decoration (J11-1, 2, 3, and 4). In Laos (Luang Prabang Province), two caves, Tam Hua Pu and Tam Nang An, were inhabited during the Hoabinhian period and were used as burial sites during the Iron Age, for which period pottery fragments bearing cord-marked decoration have been found (Sayavongkhamdy and Bellwood 2000). The Lao Pako site in Vientiane province was occupied from 2000 to 2500 B.P. (Higham 2002), and produced pottery with similar surface treatment to that found at Tam Hang (Källen and Karlström 1999). This Lao Pako material can also be compared to that of Ban Na Di and Ban Chiang Hian sites, which date to 3000–2000 B.P. (Karlström 2000).

The Tam Hang site is of great interest to scholars of palaeontology, palaeoanthropology, and archaeology. Based on stratigraphy, the position of the human and animal remains and the pottery above the lithic industry layer suggests the use of the site from at least the late Pleistocene into the Holocene. This particularity confers on the site a character rarely found in the region and the lithics document Hoabinhian in a region where it had not previously been identified. Complementary studies of this site should provide more information and refine our understanding of the prehistoric interior upland foraging human groups of mainland Southeast Asia.

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ABSTRACT

In February 1934, Jacques Fromaget, from the Geological Service of Indochina, discovered the Tam Hang site in northern Laos. The site is a rockshelter, located on the southeastern slope of the Annamitic Chain on the edge of the P'a Hang cliff. The geologist's excavation revealed considerable faunal remains from the middle Pleistocene as well as human biological and cultural remains from the pre-Holocene period. One of the human skeletons discovered by Fromaget buried beneath the shelter has recently been radiocarbon-dated to 15,740 ± 80 B.P. After being relocated by Thongsa Sayavongkhamdy, an international team carried out new excavations in April 2003. Undisturbed cultural layers from the late Pleistocene and the early Holocene have been identified. The presence of pottery and a lithic industry suggests the use of the site from at least the late Pleistocene into the Holocene. This particularity confers on the site a character rarely found in mainland Southeast Asia. This preliminary study describes the 2003 excavation, the cultural elements found, and presents the historical and archaeological significance of the site in the international context of the quest for human origins that prevailed in the 1930s. KEYWORDS: Laos, Tam Hang, rockshelter, Pleistocene, early Holocene, lithic industry, pottery.